neighbouring street gave it vibrations, which by reflection were doubled in amount. The reflector was therefore abandoned, and Rutherford resolved to have an object-glass made of the same size as that formerly used by him, but specially corrected for photographic rays. With the completion of this instrument Rutherford's best results began. In March 1866, some remarkably fine negatives were obtained with exposures from two to three seconds three days after the first quarter, and one-quarter of a second for the full moon. The publication of enlargements from these negatives, having a diameter of twenty-one inches, was much appreciated by astronomers and others interested in lunar photography.

No man has done more in the furtherance of celestial photography than Dr. Henry Draper, the son of the renowned physicist to whom reference has already been made. After a brilliant scholastic career he was associated with his father in many important researches. A journey to the British Isles in 1857 gave Dr. Draper the opportunity of visiting Lord Rosse's observatory at Parsonstown. He was so struck with the power of the great reflecting telescope, that on returning to America in 1858 he began the working of a similar speculum having a diameter of 15 inches. This was afterwards discarded, and a silvered glass Newtonian reflector, having a diameter of 15½ inches, was constructed, and adapted for celestial photography. Detailed descriptions of the construction and testing of the mirror, the method of silvering, and the manner in which it is mounted, are embodied in a memoir by Dr. Draper "On the construction and use of a silvered glass telescope, 15½ inches in aperture, and its use in celestial photography" ("Smithsonian Contributions to Knowledge," vol. xiv. p. 52, 1864). Instead of driving the telescope in the usual way by means of a clock, Dr. Draper used a sliding plate holder, driven by a "clepsydra" specially devised for the purpose. Some perfectly defined negatives were obtained in 1863, about 1½ inches in diameter; many of them were enlarged to 2 feet, and from one a magnificent picture was made in which the lunar disc had a diameter of 50 inches. The beauty of the copies was probably due to some extent to the fact that a concave mirror was used instead of a combination of lenses in the process of enlarging.

From the time when Dr. Henry Draper produced his best results until last year very little remarkable work had been done in lunar photography. In 1866, Mr. A. Brothers took several good negatives $\frac{11}{16}$ of an inch in diameter in the first focus of a 5-inch refractor, and by the insertion of a Barlow lens he increased the size of the image to 1¼ inches. Enlargements from these negatives were distributed to many astronomers, and evidence of their excellency is afforded by the circumstance that they were mistaken for some of Rutherford's productions by the editor of a scientific journal, and commented upon as such. Mr. Brothers gave a long account of the development of celestial photography in the paper in which his method of work was described (Proceedings of the Literary and Philosophical Society of Manchester, vol. v. p. 68, 1865-66.)

In 1872, Mr. Ellery, the Director of Melbourne Observatory, presented some remarkably sharp lunar photographs to the Royal Astronomical Society, that he had obtained by means of the great reflector (*Monthly Notices R.A.S.*, vol. xxxiii. p. 219, 1873.)

Amongst other lunar photographs possessed by the Royal Astronomical Society are two taken by Dr. Gould at Cordoba Observatory in 1875-76, in each of which the moon has a diameter of nearly 20 inches. A photograph taken in 1877 by Prof. Pritchard at Oxford, with the reflector used by De La Rue, and some taken in 1880 by Mr. Common with his three-foot reflector, also figure in the above collection as remarkable works of art having an important scientific signification.

In a recently published paper on "Astronomical Photography at the Lick Observatory" ("Publications of the Astronomical Society of the Pacific," vol. ii., No. 9), Prof. Holden gives a detailed account of the photographic apparatus of the great equatorial, and the work done with it. The image of the moon in the first focus of this instrument is nearly five and a quarter inches in diameter, and the negatives bear easily an enlargement of 570 diameters, and even double this amount. In the production of these negatives the aperture of the object-glass was reduced to 12 inches. From an examination of the best pictures yet taken at the Lick Observatory, Prof. Holden finds that parallel walls on the moon whose tops are no more than 200 yards or so in width, and which are not more than 1000 or 1200 yards apart, are plainly visible. A series of copies from the negatives obtained at Lick Observatory has been published.

Some photographs of the moon taken in March last, by the Brothers Henry, at Paris Observatory, appear to eclipse all previous ones. The instrument used was the 13-inch photographic equatorial, and an examination of the plate which accompanies this note will show that real progress has been made. The superiority of the results is due not only to the perfection of the object-glass, but to the use of a secondary magnifier, by means of which the size of the image at the first focus was increased fifteen times. It is manifest that this method of direct enlargement possesses many advantages over that ordinarily used, and its further development will be awaited with considerable interest.

There is no doubt that enlarged photographs of our satellite are capable of affording more information regarding its surface than can be gained by years of diligent observation, whilst their multiplication at different epochs will enable selenographers to readily detect changes of a comparatively minute character. The study of the lunar surface has always excited interest. Hence the contribution to knowledge afforded by the photographs taken by MM. Paul and Prosper Henry will not lack the appreciation it fully deserves.

RICHARD A. GREGORY.

COMPARATIVE PALATABILITY OF INSECTS, &c.

IN the course of last autumn and the present summer we made a series of experiments bearing upon the relative palatability of insects, &c.,; the animals chiefly experimented on being domestic mice, common toads, and a common Mynah (*Acridotheres tristis*). We obtained the following results.

Among beetles, *Carabus violaceus*, which emits a very strong, unpleasant-smelling fluid, was once eaten by the toads, and twice by the mice. As a rule, however, it seemed too large and strong for either. The Mynah, also, was not very fond of it.

Torostichus niger, and the nearly-allied red-legged species, which also emit strong-smelling fluid, were readily taken by all the animals under observation: though they sometimes caused the mice a little trouble.

The small copper-coloured ground-beetles were eaten readily by the Mynah and toads, but in every case refused by the mice.

Melolontha vulgaris was liked by the mice and toads. We did not offer it to the Mynah.

Coccinella bipunctata was invariably licked and refused by the mice, even when hungry. The toads took it readily. We did not offer it to the Mynah.

Ocypus olens, the "devil's coach horse," was taken without hesitation by the toads, even in its defiant attitude, with the head and abdomen erected. On one or two occasions, however, it was immediately ejected. This has also happened with *Torostichus niger*, and appears

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to be due to the bite of the insect rather than to the emission by it of unpleasant matter. The *Ocypus* was eaten by the Mynah.

The red soldier-beetle was seized by one mouse, which, however, left the abdomen. It was refused by another, which was feeding rather poorly at the time; though the same animal, immediately afterwards, killed and partly ate a house-fly. This beetle was eaten by the toads. We did not offer it to the Mynah.

The dung-beetle (*Geotropes stercorarius*) was offered only to the toads. It was apparently too large and strong for them.

Among Hymenoptera, only one *Bombus* (*terrestris*) was offered to the mice: they seemed afraid to touch it. We were surprised at this, in the face of Darwin's fact of field-mice attacking nests of Bombi. The Mynah ate wasps greedily. The toads readily took wasps and bees (*Megachile*, *Apis*, *Bombus*), only occasionally refusing the large queens of the Bombi. They were often stung, but did not seem to suffer from this, since they would take three or four of the insects in succession.

We were not fortunate enough this year to take any of the Chrysididæ. Experiments should certainly be made with these.

Of Lepidoptera, the Mynah was offered *Pieris rapæ* and *Vanessa urticæ*. It would eat both; but greatly preferred the latter. We gave the mice *Pierides rapæ* and *napi*, *Vanessa urticæ*, *Tryphæna pronuba*, some other (dull-coloured) *Noctuæ*, and some *Geometræ*. All were eaten. *Pieris rapæ*, *Vanessa urticæ*, *Bryophila perla*, *Plusia gamma*, and several other (dull-coloured) moths, were offered to the toads. Two specimens of the *Bryophila* were eaten; but the other insects were almost invariably unregarded. This appeared to us to require explanation, as the other animals ate butterflies and moths so readily. We kept our toads in an open enclosure; and were therefore obliged to mutilate the wings of the insects given them. The consequence was that these either fluttered violently or remained perfectly stationary; and toads do not seem to take food under either of these conditions.

The silkworm moth was taken by the mice; to which alone we offered it.

The swallow-tail moth (*Urapteryx sambucaria*), of which we only obtained one specimen, was eaten by a mouse.

Green and brown larvæ were taken greedily by the Mynah and toads. The latter also ate the bright-coloured caterpillars of *Pieris* sp. (*rapæ?*), and any hairy caterpillars that were offered them. Among them was that of *Orgyia antiqua*. In one case a hairy caterpillar was not swallowed till two or three attempts had been made to secure it. No hairy caterpillars were offered to the other animals.

Some bright orange-coloured larvæ, with black heads—found feeding, in a web, on hawthorn—were readily eaten by the toads and by one mouse. Another mouse (feeding poorly) refused them.

A scarlet-and-black bug was eaten by the toads; as also was the lace-wing fly (*Chrysopa perla*). Neither insect was offered to the other animals.

Three sword-tailed grasshoppers were readily eaten by a mouse.

Blatta orientalis was eaten by the toads. We did not give it to the mice. The Mynah for a long time refused it, and only took it finally in the dearth of other insects. The same holds good, in its case, of *Lumbricus terrestris*.

A few centipedes were given to the mice and the Mynah. These were never eaten; though the mice, in one case, eagerly seized and killed a large specimen. We offered small frogs to the Mynah, which seized, but did not eat them; leaving them apparently unhurt. The toads eat —though with some difficulty—small newts; which a water tortoise (*Emys* sp.) will not take.

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A young heron (*Ardea cinerea*), which takes frogs freely, killed, but did not eat, a common toad.

A water-tortoise (*Emys* sp.), though it eats small frogs, will not touch a toad. E. B. TITCHENER.

Zeuzera æsculi was offered to a prairie owl at the Zoological Gardens; and though eagerly seized, left alive after considerable examination. Queen ants were taken by toads and by the common lizard (*Lacerta vivipara*).

F. FINN.

THE PROGRESS OF BIOLOGY IN CANADA.

WE have before us the official account of the formal opening of the new building of the Biological Department of the University of Toronto, on December 19 last. The building is a substantial stone one in Scottish Norman style, replete with the most modern fittings and accessories; and the lecture hall, which may be approached independently of the main edifice, is benched to seat a minimum audience of 250. The work of the institution is presided over by Prof. R. Ramsay Wright. The classes in biology are said to be among the largest in the University, and the excellence of the new arrangements and teaching appliances elicited, at the opening ceremony (from Prof. Osler, an old student of the parent college), the remark that "it is possible for one to live through a renaissance, similar perhaps in kind, less important in degree, than that" directed against mediæval thought. May this be justified! Certain it is that the biological work now in progress in Toronto was begun under most auspicious circumstances.

Prof. Ramsay Wright is well-known and respected in this country and, at the opening of his new building, allegiance was sworn him by Minot and other biologists of the New World whose published researches, like his own, rank high in contemporary literature. Investigations like those upon the spiracular cleft of Ganoids, the nervous system of the tadpole's epiderma and of the liver, which his school has given to the world, are not to be easily matched as thoroughgoing and honest pieces of work. They denote a high standard of attainment, and one which, in face of the inanities of certain trans-Atlantic workers of another type, must be maintained if the biological brotherhood of the New World is to hold its own.

The Biological Department of the University of Toronto exists in connection with a Medical School, and it is therefore not surprising to find signs of a leaning towards bacteriology and those allied branches of study which, as being furthered by Mentschnikoff and his pupils, by Darier, Podwyssozki, Neisser, Ruffer, Macallum, and others, are just now assuming a revolutionary phase. Indeed, the key-note was struck by Prof. Wright in the peroration to his opening address, in which he said that "not only bacteria, but low forms of animal life furnish important pathogenic organisms." We rejoice in this the more, now that an outcry against the biological training of the surgeon-student is being raised at home, by persons who clamour for the restoration of an apprenticeship system. From the utterances of distinguished medical experts made at the Toronto ceremony, it is certain that this proposal will meet with no response from the New World.

The Biological Institute of Toronto is detached from the main University building. The latter was, on February 14 last, almost wholly destroyed by fire. During the preparations for the annual *conversazione*, a wooden

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